

INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: INSP
CNRS identification code: UMR 7588
Internship director's surname: Emmanuel Lhuillier
e-mail: el@insp.upmc.fr Phone number: 01 44 27 82 37
Web page: <http://www.insp.jussieu.fr/~Lhuillier-Emmanuel-.html?lang=fr>
Internship location: Sorbonne université - 4 place jussieu, 75005 Paris

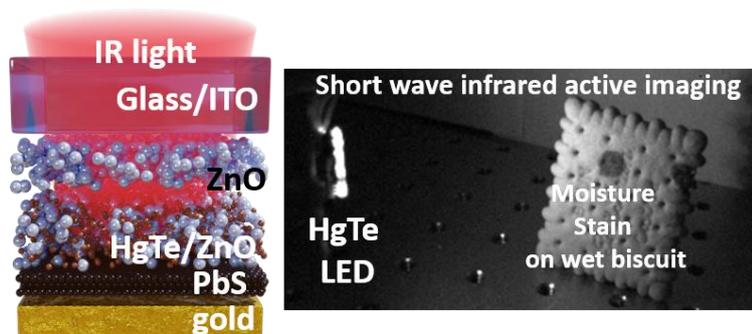
Thesis possibility after internship: YES
Funding: YES/NO ANR under application

Infrared Quantum dot based LED

Scientific description: Nanocrystals are one of the few nanotechnologies to have reached a mass market with their use as green and red source for display. The next challenge is now to switch to electrical pumping (*ie* LED) to reduce electrical consumption and achieve higher contrast.

In the visible such devices have already been reported. In the infrared, far less work has been done and in particular for wavelength above 2µm which are of utmost interest to monitor green-house effect or to conduct active imaging

In particular we aim to tackle the poor light extraction of current QLED (only 20% of emitted photon can be extracted due to optical index mismatch). By introducing subwavelength structure, we aim to induce directivity and spectral shaping to the LED and thus enhanced performances



Left scheme of HgTe nanocrystal based LED
Right infrared image a wet biscuit illuminated by the infrared QLED which highlights the presence of a moisture stain

references: Electroluminescence from HgTe Nanocrystals and its Use for Active Imaging, J Qu et al, Nano Letters 20 (8), 6185-6190

Techniques/methods in use: It is a pluridisciplinary project combining nanocrystal synthesis, electromagnetic design, photoemission measurements on synchrotron, clean room and glove box fabrication as well as optoelectronic measurements

Applicant skills: The project takes place in an international team so that English speaking is mandatory. French will be a plus. A strong background in semiconductor and a good level of motivation are also necessary. Skill in clean room fabrication or nanocrystal synthesis will be a plus but is not mandatory

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES Soft Matter and Biological Physics: NO
Quantum Physics: YES Theoretical Physics: NO